

Ty-154M

FLIGHT MANUAL

Book 1



DISCLAIMER

The author of this reediting is not associated with Felis, from Felis' Planes, nor with Joint Stock Company Tupolev, nor with Syrian Arab Airlines.

All of the content of this manual was extracted from the manual provided with Felis' TU-154M package. This package can be purchased in the following website: http://store.x-plane.org/Tupolev-Tu-154_p_492.html

THIS MANUAL IS FOR FLIGH SIMULATION ONLY

Although this is a mostly page by page copy of the original manual provided by Felis, it is prone to errors that the original document did not contain. Because of this inevitable margin of error, this version of the document should not be used for real flight under any circumstances.

Editor Notices

This rendition of the flight manual is sill a work in progress. You may find typing errors, wrong numbers and missing text that originally was written with Cyrillic characters. This faults are acknowledged by the author and pointing them out is very helpful for the development of this manual. If you find any of these errors fell free to send me an private message or make a post in this topic of the X-Plane.org forums:

<https://forums.x-plane.org/index.php?/forums/topic/136251-would-you-like-a-new-version-of-the-tu-154-manual/>

As for formatting, the goal is to get this version of the manual to resemble the source material closely although a identical copy is ultimately impossible. Because of this the page numbering of the two different works is not identical, some sections that were in new pages appear in the same page with the previous section, etc... One major liberty I took its to not included the (*cont'd*) remarks at the end of some pages. I've chosen this path because it is very difficult to control page breaks manually for every single page in a efficient way, just expect to see the end section symbol.

I hope this manual pleases the X-plane community, with this I mean that I'm open to suggestions and changing the some aspects of the original manual if there is a demand for it. Of course that are some things that I can not do, some by lack of skill, and those who want to help where I failed are welcome, others out of the respect for the source material, trying to keep its feel.



Contents

1	GENERAL	4
1.1	List of Symbols and Abbreviations	5
1.2	Airworthiness Certificate	8
1.3	Purpose of Manual	9
1.4	Manual Holder's Duties	10
1.5	Usage of Symbols and Abbreviations	11
1.6	Revision System	12
1.7	Usage of Checklists and Procedures	13
2	GENERAL OPERATIONAL LIMITATIONS	14
2.1	Airplane Category	15
2.2	General Operational Limitations	16
2.2.1	Operational Conditions and Types of Operation	16
2.2.2	Altitude of Flight and Air Temperature	17
2.2.3	Wind	19
2.2.4	Class and Category of Aerodromes	19
2.2.5	Condition of Runway	19
2.3	Minimum Crew	22
2.4	Maximum Number of Occupants	23
2.5	General Flight Limitations	24
2.5.1	Weight	24
2.5.2	Cargo and Passenger Compartments Floor Loading	24
2.5.3	Center of Gravity	24
2.5.4	Speed and Mach Number	24
2.5.5	Load Factors	30
2.5.6	Bank Angles	30
2.6	Systems and Equipment	31
2.7	Temporary Limitations	31
3	PREPARATION FOR FLIGHT	32
3.1	Calculations of Flight Data	33
3.1.1	General	33
3.1.2	Initial Data for Calculation of Flight Data	33
3.1.3	Selection of Flight Level and Best Enroute Mode of Flight	34
3.1.4	Calculation of Required Fuel Supply	35



3.1.5	Calculation of Maximum Allowable Takeoff Weight, Flap Setting Angle and Decision Speed	70
3.2	Pre-Flight Check	74
4	NORMAL PROCEDURES	74
4.1	Taxiing	74
4.2	Takeoff	74
4.3	Climb	74
4.4	Enroute Flight	74
4.5	Descent	74
4.6	Landing Approach	74
4.7	Landing	74
4.8	Procedures	74
4.9	List of Acceptable Failures	74



Ty-154M

SECTION 1

GENERAL



1.1 List of Symbols and Abbreviations

ATT	angle-of-attack and acceleration warning system
ADF	automatic direction finder
AFCS	automatic flight control system
ALW	actual landing weight
APL	actual payload
APU	auxiliary power unit
ATC	air traffic control
ASD	accelerate-stop distance
ASDA	accelerate-stop distance available
BRC	best-range cruise
BT	block time
CAS	calibrated airspeed
CF	compensation fuel
CG	center of gravity
DG	direction gyro
DME	distance measuring equipment
EGT	exhaust gas temperature
EWV	equivalent tailwind (headwind) velocity
F	field
FDI	flight director indicator
FDRS	flight data recording system
FLA	field length available
FR	fuel reserve
FS	fuel supply required
G	gradient of climb
GW	gross weight
GPWS	ground proximity warning system
HD	horizontal distance
HF	high frequency
HSC	high-speed cruise
HSI	horizontal situation indicator
IAS	indicated airspeed
ICAO	International Civil Aviation Organization
IFF	identification friend-or-foe
IFR	instrument flight rule
ILS	instrument landing system



ISA	International Standard Atmosphere
LD	landing distance
LDA	landing distance available
LG	landing gear
MAC	mean aerodynamic chord
MLW	maximum allowable landing weight
M _{MO}	maximum operating limit mach number
MOLW	maximum operational limit landing weight
MOTOW	maximum operational limit takeoff weight
MPL	maximum limit payload
MPL/TOS	maximum allowable payload limited due to takeoff safety
NWD	no-wind distance
NWF	no-wind fuel
OAT	outside air temperature
OW	operational weight
RD	maximum distance to return point
RF	regulatory fuel reserve
SR	specific range
SWY	stopway
TAS	true airspeed
TGR	takeoff ground run
TOD	normal (continued) takeoff distance
TODA	takeoff distance available
TRA	takeoff run available
TT	track in 180° turn
V _{BC}	best-hourly-fuel-consumption speed
V _{LA}	approach speed
V _{MO}	maximum operating limit speed
V _R	rotation speed
V _{REF}	approach speed
V _S	stalling speed
V _{TD}	maximum limit touch-down speed
V ₁	decision speed
V ₂	takeoff safety speed
V _{2n}	climbout speed with all engines operating
V ₃	speed at start of extendable (high-lift) devices retraction
V ₄	clean configuration takeoff speed



V_{FR}visual flight rules
VHF very high frequency
WA wind angle
WCFwind correction fuel
WVwind velocity



1.2 Airworthiness Certificate

Each Tu-154M airplane delivered to Syrian Arab Airlines is furnished with the Air-worthiness Certificate issued by the Ministry of Aircraft Industry of the USSR.



1.3 Purpose of Manual

1. The Flight Manual of the Tu-154M airplane is the main technical publication establishing and regulating the rules of its flight operation, flight technique and procedures to be followed in various conditions of flight with peculiarities of the airplane piloting and procedures established for abnormal and emergency situations included.

The Flight Manual includes the performance data, required for calculation of flight parameters, and other reference data.

2. The correct operation of the airplane ensuring full safety and economic effectivity of each flight is impossible without excellent knowledge of the present Flight Manual and correct practical employment of the instructions covered therein.
3. The requirements and instructions of the Flight Manual are mandatory for all the flight crew members and other crew members during the flight operation of the airplane.
4. **NEVER** fly without the Flight Manual aboard the airplane.



1.4 Manual Holder's Duties

1. The holder of the Flight Manual is the Commander of the flight unit. In other divisions (organizations) using the Flight Manual as a standard publication of the holder in their manager.
2. The holder of the Flight Manual is responsible for timely and correct introduction of all the issued revisions and additions into the Flight Manual in accordance with the established procedure (Ref. subsection 1.6).
3. The Captain is responsible for having the Flight Manual aboard the airplane in every flight and ensuring the possibility of rapid extraction of required information therefrom at any moment on the ground and in flight.



1.5 Usage of Symbols and Abbreviations

1. For quick determination of the nature and coverage of the revisions and additions introduced in the Flight Manual after its initial issue, the respective portions of the text are identified by means of a vertical black line along the newly issued pages.
2. Abbreviation “cont’d” placed in the page lower margin indicates that the text of a given paragraph is continued on the following page.
3. Symbol “ _____oOo_____ ” placed after an accomplished subsection indicates its end.
4. To reduce the Flight Manual bulk, abbreviations of several, most frequently used terms, word and groups of words are used in its text, e.g.:
 - MAC – mean aerodynamic chord
 - RWY – runway
 - TO – takeoff



1.6 Revision System

1. Improvement of operational procedures, introduction of changes in design or composition of equipment causes a necessity of introduction of revised and additional data.
2. Revisions are introduced in the following way:
 - Replacement of pages.
 - Insertion of additional pages.
 - Deletion of pages.
3. The revised additional pages, list of effective pages are disseminated with the Service Bulletins. The date of revision appears on each new page.

Each revision is recorded in the Record of Revisions.



1.7 Usage of Checklists and Procedures

1. The check, being the main procedure in preparation of the airplane and the crew for the subsequent stage of flight, provides performance by each crew member of mandatory steps required for operation of the airplane and described in the in the checklist. Preparation in accordance with the checklists is performed:
 - (a) During outside inspection of the airplane.
 - (b) During inside inspection of the airplane.
 - (c) Before starting the engines.
 - (d) Before taxiing out of the parking area.
 - (e) after crossing altimeter setting altitude.
 - (f) Before descent.
 - (g) Before leaving the airplane in the parking area.
2. The detailed descriptions of procedures to be followed in operation of the airplane systems and equipment and specified by the checklists are covered in the respective subsections of section 8
3. The checklist of operations to be performed by each crew member consists of two columns: the left one contains a brief nomenclature of the object to be checked, the right one contains a generalized description of the required operations.

In the checklists of the airplane outside and inside inspection during preflight preparation, the right columns contains a generalized description of the required characteristic of the object to be inspected which can be assessed visually.



Ty-154M

SECTION 2

GENERAL OPERATIONAL LIMITATIONS



2.1 Airplane Category

1. The airplane is designed and built to the design criteria and requirements effective in the USSR and applicable to the given airplane category.
2. The airplane is intended for transportation of passengers, baggage, cargo and mail on the airlines having aerodromes with artificial pavement.
3. Performance of aerobatics is not allowed for the airplane.



2.2 General Operational Limitations

2.2.1 Operational Conditions and Types of Operation

1. The airplane is authorized to perform the following types of flight:
 - Day and night flying.
 - VFR and IFR flying.
 - Flying in icing conditions, thunderstorm areas, shower, hail and snow showers.
 - Overwater flying.
 - Flying over unmarked and flat terrains.
 - Flying over mountainous terrain.
 - Flying in latitudes close to the poles
2. The airplane is allowed to fly the routes running over the areas with any climatic and geographical conditions.
3. Weather minimum of 30x400 m (ICAO Category II) for the airplane for operation from aerodromes certificated according to ICAO Category II. The minimum for takeoff is established at visibility of 200 m on the runway.

NOTES:

1. The minimum for takeoff is used on the aerodromes, equipped with the runway centerline lights, in the daytime and at night.
2. If the runway centerline lights are not available, with the runway centerline marked, the aerodrome minimum for takeoff is 500 m in the daytime and 700 m at night.
3. If the lighting equipment is not available the aerodrome minimum for takeoff is established equal to the minimum for the landing at the given aerodrome.
4. The minimum for takeoff is used with an alternate aerodrome available, flight to which from the departure aerodrome does not exceed two hours.



2.2.2 Altitude of Flight and Air Temperature

1. The maximum allowable altitude of flight:

With CG up to 32% of MAC

Flight level	390	380	370
Pressure altitude, m	11900	11600	11300
Maximum gross weight, kg	84000	90000	96000

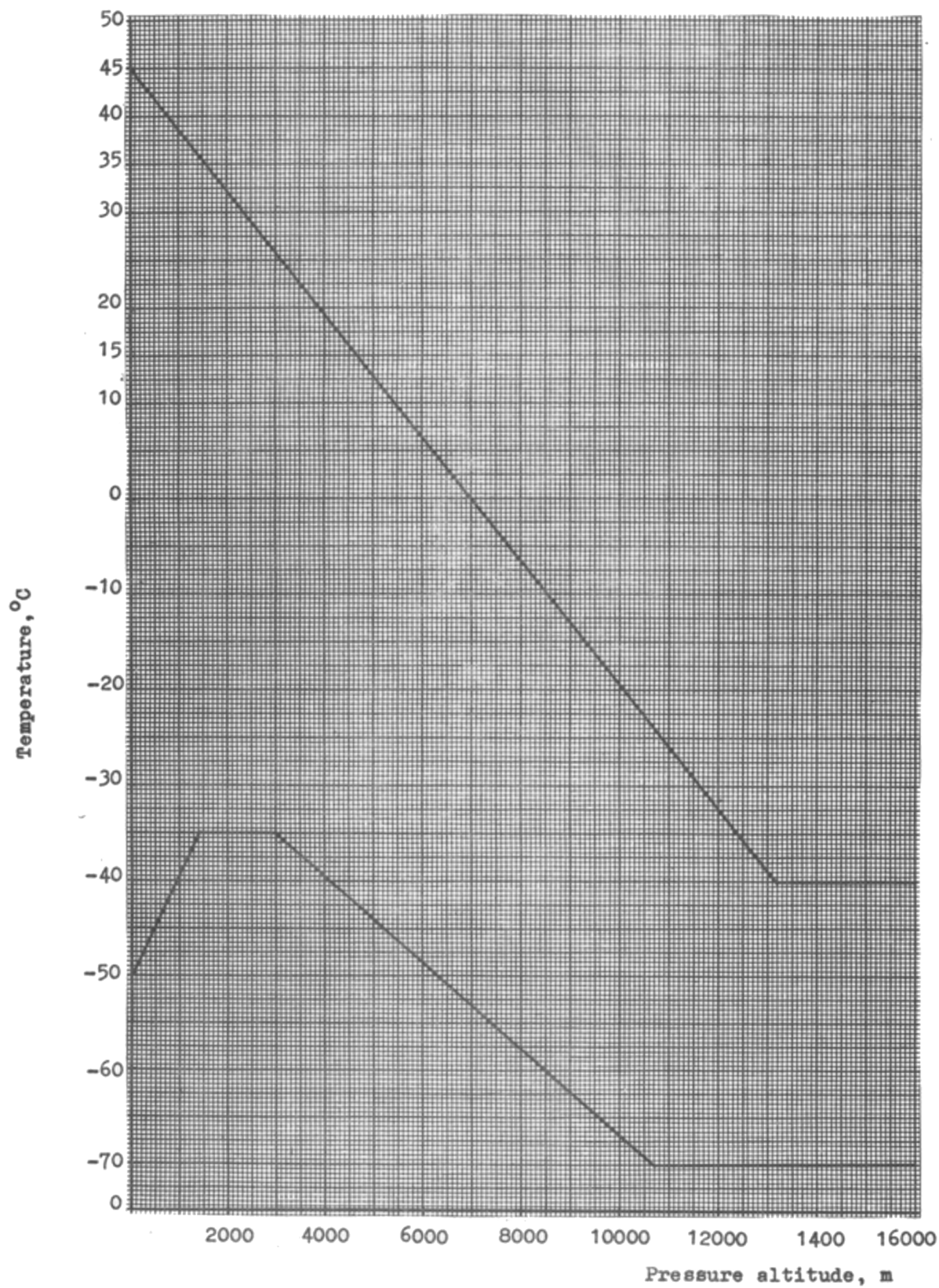
With CG aft of 32% MAC, flight level is 330 (10,050 m)

2. Takeoff and landing of the airplane are allowed from/on the aerodromes located at elevations corresponding to pressure altitudes within the range from -305 up to 3000 m.
3. The airplane may be operated within the range of ambient temperatures indicated in Fig. 2.2.1 provided all the performance limitations depending on the aerodrome temperature and pressure are observed.



ICAO Standard Atmosphere

Figure 2.2.1





2.2.3 Wind

1. Wind maximum limit for taxiing and towing30 m/s
2. Wind components maximum limits for takeoff and landing from /on dry runway:
 - Headwind 30 m/s
 - Tailwind 5 m/s

Crosswind at 90° to runway:

- In normal conditions17 m/s
- With two hydraulic power systems inoperative 10 m/s

The graph which enables determination of the wind components is given in Fig. 2.2.2.

3. Crosswind component at 90° to runway covered with atmospheric precipitation:
 - Up to 3 mm high To be derived from Fig. 2.2.3 for friction coefficient which is determined from Table 3.1.12.2
 - More than 3 mm high 5 m/s

2.2.4 Class and Category of Aerodromes

The airplane with the maximum takeoff weight may be operated from aerodromes having hard pavement.

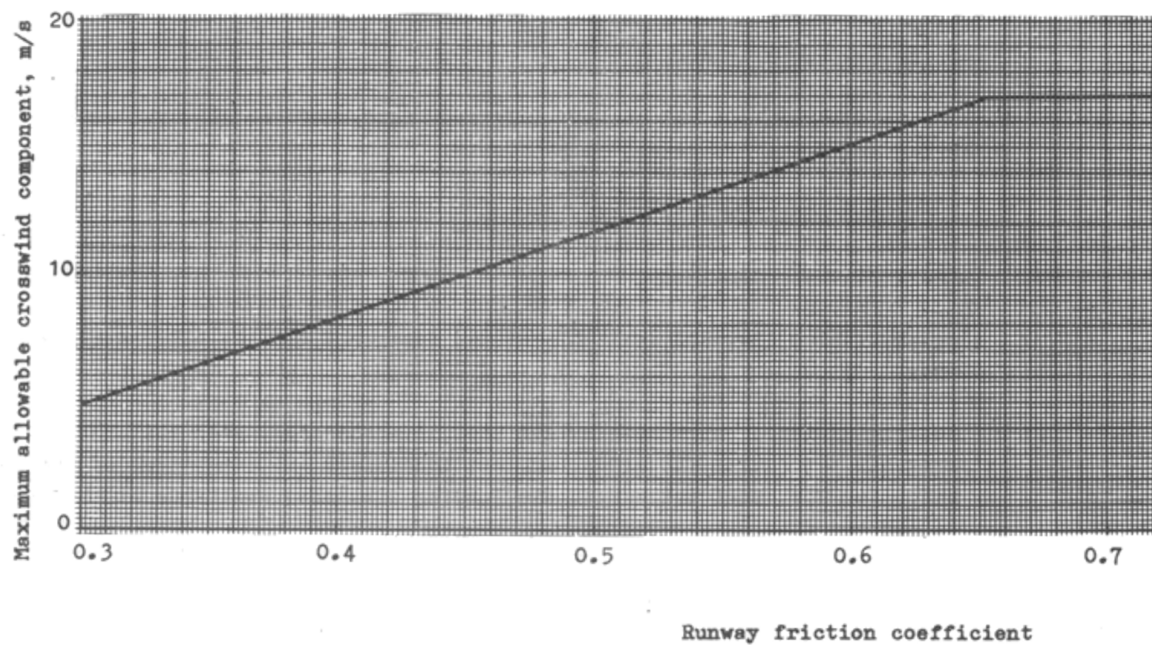
2.2.5 Condition of Runway

1. Takeoff and landing are allowed from/on the runways which meet the following requirements:
 - Friction coefficient0.3, min
 - Icenone
 - Height of layer of water 10 mm, max
 - Height of layer of slush 12 mm, max
 - Height of layer of dry snow 50 mm, max



Maximum Allowable Crosswind Component for Runway Friction Coefficient

Figure 2.2.3





-
2. The runway slope limit ± 2 %
 3. The required distances calculated by the crew (Ref. paragraph 3.1.5):
 - Takeoff run distance.
 - Continued takeoff distance.
 - Accelerate-stop distance.

With the actual ambient and runway conditions accounted for must not exceed the following available distances, respectively:

- Takeoff run distance available.
 - Takeoff distance available.
 - Accelerate-stop distance available at the departure and the alternate aerodrome.
4. The landing distance calculated by the crew in accordance, with the instructions of paragraph 3.1.6 with the actual ambient conditions and conditions of the runway accounted for, must not exceed the landing distances available at the destination and the alternate aerodromes.



2.3 Minimum Crew

1. The minimum flight crew with which the airplane is allowed to fly is three-member crew, including:
 - Captain.
 - Co-pilot.
 - Flight engineer.
2. Supernumerary crewmembers, for whom stations are provided in the airplane, may be included in the crew at the penalty of the payload.



2.4 Maximum Number of Occupants

1. The maximum number of occupants must not exceed the number of seats provided with the belts.
2. The maximum number of occupants for the airplane layout version is given in Table 2.4.1

Table 2.4.1

Layout version	Maximum number of occupants	Passengers		Flight crew	Cabin attendants
		grown-ups	children up to 5 years		
136	149	136	4	3	6
149	162	149	4	3	6
159	172	159	4	3	6
93 - 104	106 to 177	93 to 104	4	3	6



2.5 General Flight Limitations

2.5.1 Weight

1. Maximum weight 100,500 kg
2. Maximum takeoff weight 100,000 kg
3. Maximum landing weight 80,000 kg
4. Maximum zero fuel weight 74,000 kg

2.5.2 Cargo and Passenger Compartments Floor Loading

1. Maximum loading of passenger compartments flooring 280 kgf/sq.m
2. Maximum loading of structural framework of passenger compartments floor 400 kgf/sq.m
3. Maximum loading of cargo compartments floor 600 kgf/sq.m

2.5.3 Center of Gravity

1. Forward center of gravity limit for takeoff, LG down 21 % MAC
2. Forward center of gravity limit for landing, LG down 18 % MAC
3. Aft center of gravity limit, LG up:
 - (a) for takeoff, enroute and landing 32 % MAC
 - (b) for conditions with no payload or with payload available not allowing to shift the center of gravity to 32 % MAC and farther forward, at takeoff weights up to 80,000 kg and altitude of 10,200 m, with AFCS operating only in manual control mode 40 % MAC

2.5.4 Speed and Mach Number

All the speeds mentioned in the Flight Manual are the calibrated airspeeds (CAS), but due to the fact that with the airspeed indicators fed by the main static pressure system the values of the total airspeed corrections (accounting for both the position and instrumental errors) are insignificant, the above airspeeds are assumed to be the indicated airspeeds (IAS).

When changing the instruments for the standby static pressure system, account for the altitude position error corrections (Ref. Table 7.9.4).



2.5.4.1 MAXIMUM OPERATING LIMIT SPEEDS AND MACH NUMBERS

1. Maximum operating limit speed V_{MO} and M_{MO} :
 - at altitudes from sea level up to 7000 m 600 km/hr
 - at altitudes from 7000 m up to 10,300 m 575 km/hr
 - at altitudes of 10,300 m and above $M = 0.88$
 2. Maximum operating limit speed with roll damper or yaw damper inoperative, at all gross weights 525 km/hr or $M = 0.85$
 3. Maximum flap extended speed V_{FE} with flaps extended to:
 - 15° 420 km/hr
 - 28° 360 km/hr
 - 36° 330 km/hr
 - 45° 300 km/hr
 4. Maximum landing gear operating speed V_{LO} :
 - In normal conditions 400 km/hr
 - In emergency descent within limitations of 2.5.4.1(1)
- NOTE:** In case of emergency (ferry flight with the landing gear down or the landing gear retraction after takeoff with the LG doors closed), it is allowed to perform flight at a speed not more than 450 km/hr.
5. Maximum spoiler extended speed:
 - With mid-wing spoilers extended within limitations of 2.5.4.1(1)
 - With inboard spoilers extended 300 km/hr
 6. Maximum stabilizer operating speed 425 km/hr
 7. Maximum slat extended speed 425 km/hr
 8. In the course of slat retraction, an acceleration up to 450 km/hr is allowed, this limit being attained by the moment of complete retraction of the slats.
 9. Maximum landing light extension speed 340 km/hr



10. Maximum ground speeds:

- For rotation315 km/hr
- For lift-off 325 km/hr
- For touchdown by main LG wheels280 km/hr
- For initial application of wheel brakes during landing roll230 km/hr

11. Maximum taxiing speed:

- Straightforward 30 km/hr
- In turns with radii of 40 m and more30 km/hr
- In turns with minimum radius (7 m) 10 km/hr

NOTE: The taxiing speed is decreased in turns from 30 km/hr down to 10 km/hr progressively with the radius of turn decreasing from 40 down to 7 m.

- On runway covered with atmospheric precipitation 15 km/hr

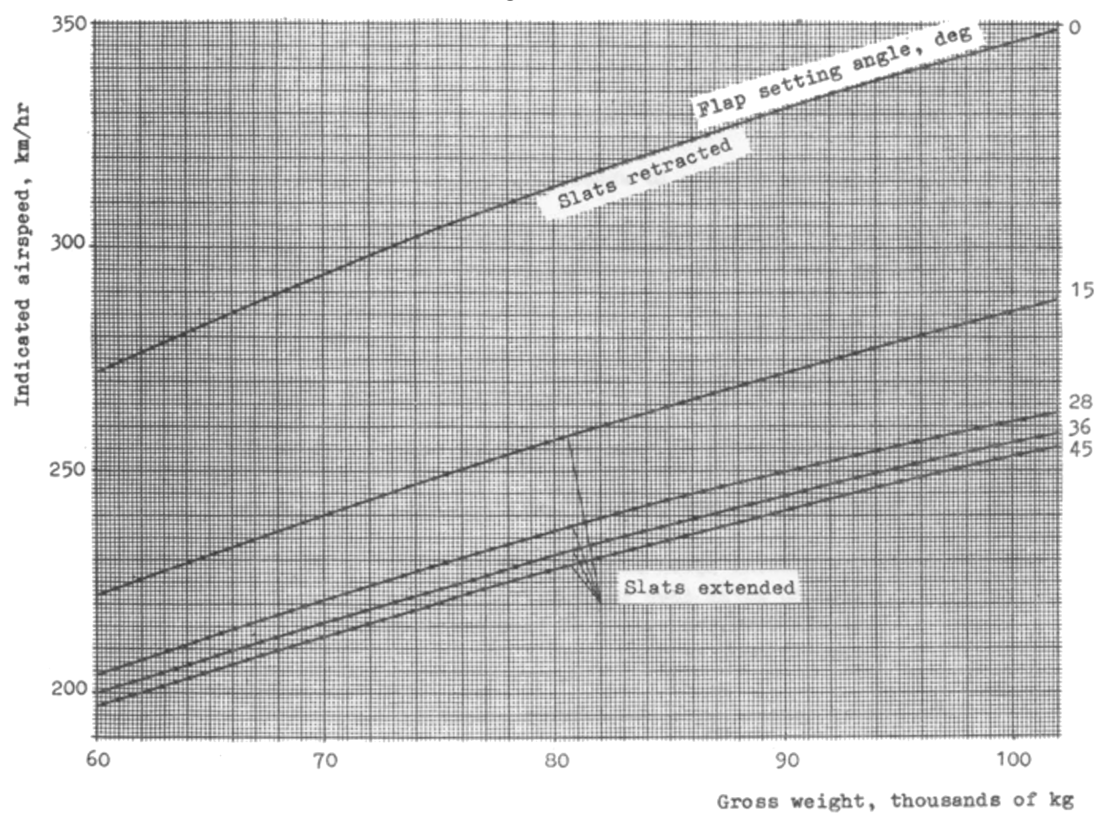
2.5.4.2. MINIMUM LIMIT SPEEDS

1. The minimum limit speeds approved for takeoff and landing of the airplane (at which the automatic angle-of-attack and acceleration warning system (AAT) actuates) and the stalling speeds are shown in Figs 2.5.1, 2.5.2.
2. The minimum safety speed during flight in enroute configuration shall be not less than 1.3 of stalling speed at altitudes below 5000 m and not less than 1.35 of stalling speed at altitudes above 5000 m (Ref. Fig. 7.8.1).
3. The crew is warned of attainment of the minimum limit speed at acceleration of 1 g by actuation of the light and audio warning devices which are actuated by the AAT (the red light on the AAT indicator at the Captain's station and the red STALL (α_{KP}) annunciator at the Co-pilot's station come on, and the loudspeaker installed at the crew's wardrobe partition sounds continuously).



Minimum Takeoff and Landing Speeds

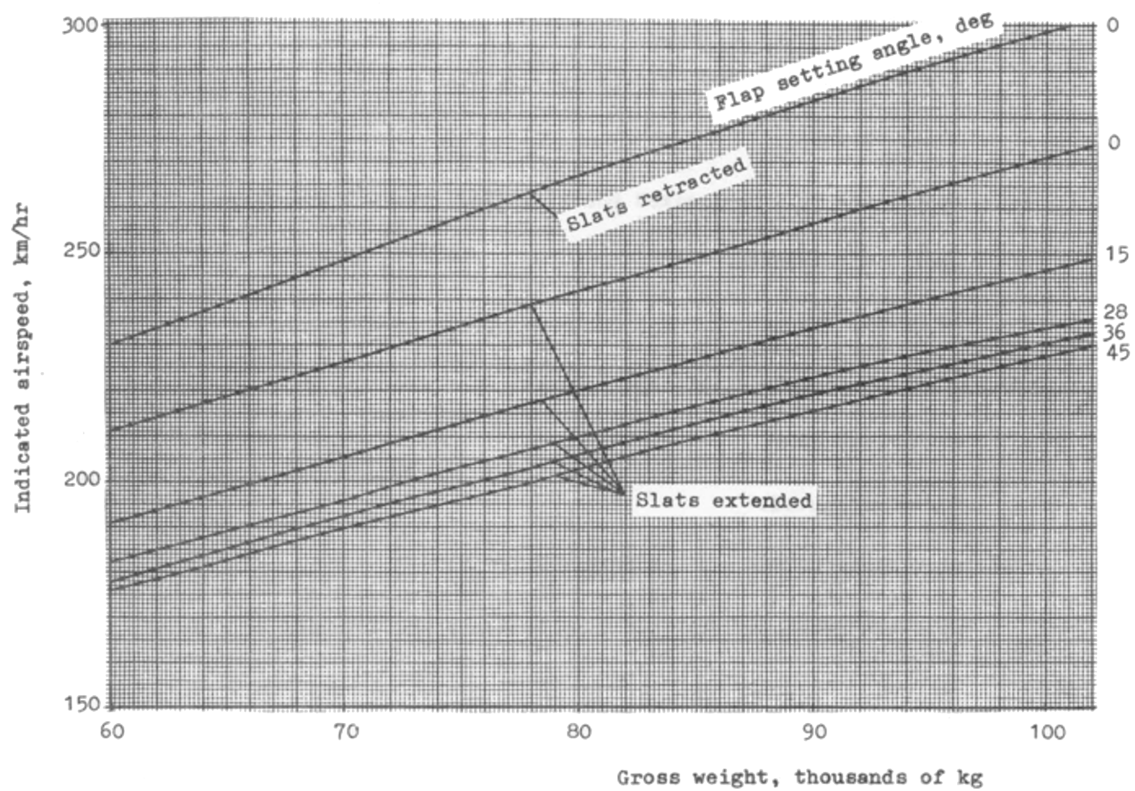
Figure 2.5.1





Stalling Speeds

Figure 2.5.2





2.5.4.3 AIRPLANE CONFIGURATIONS FOR VARIOUS STAGES OF FLIGHT

1. For takeoff:

- Flaps 15° or 28° (Ref. paragraph 3.1.5).
- Slats extended.
- Stabilizer in harmonized position (Ref. Table 2.5.4.1).
- Spoilers retracted.
- LG down.

2. For climb, enroute flight and descent:

- Flaps retracted.
- Slats retracted.
- Stabilizer in the enroute position (0°).
- Spoilers retracted (the mid-wing spoilers are extended in descent, if required).
- LG up.

3. For emergency descent:

- Flaps retracted.
- Slats retracted.
- Stabilizer in the enroute position (0°).
- Mid-wing spoilers extended.
- LG down.

4. For landing:

- 45° or 36° in normal conditions, as established by paragraph 3.1.6.
- 45°, 36° or 28° with two engines operating, as established by paragraph 3.1.6.
- 15° with one engine operating.
- Slats extended.
- Stabilizer in harmonized position (Ref. Table 2.5.4.1).
- Mid-wing and inboard spoilers extended (automatically after touchdown).
- LG down.



5. Harmonized positions of stabilizer and wing high-lift devices.

Table 2.5.4.1

Airplane configuration	Flap setting angle, deg.	Slat position	CG position, % MAC		
			18 to 24	24 to 32	32 to 40
			Stabilizer control setting		
			II (FWD) Green	C (MIDWAY) black	3 (AFT) yellow
			Stabilizer harmonized position, deg.		
Enroute	0	Retracted	0	0	0
Takeoff	15, 28	Extended	3	1.5	0
Landing	36, 45	Extended	5.5	3	0

2.5.5 Load Factors

1. Maximum operational limit load factors for all the airplane weights:

- With the wing high-lift devices retracted2.5
- With the wing high-lift devices extended2.0

2. Minimum operational limit load factors for all the airplane weights:

- With the wing high-lift devices retracted-1.0
- With the wing high-lift devices extended 0

3. Execution of the maneuvers is limited by:

- Maneuvering limit load factors:
 - Maximum 1.8
 - Minimum 0.5
- Actuation as warned by the AAT.
- Attainment of the bank limit angles warned by the coming-on the HIGH L BANK (CYRILLIC-PLACEHOLDER) or HIGH R BANK (CYRILLIC-PLACEHOLDER) annunciators.

2.5.6 Bank Angles

1. Maximum limit bank angles:

- For takeoff and landing $\pm 15^\circ$
- For remaining conditions $\pm 33^\circ$



2.6 Systems and Equipment

The systems and equipment operational limitations are covered for each system in section 8.

2.7 Temporary Limitations

1. Maximum permissible flight altitude for all flight weights ...11000m (echelon 360)
2. Maximum permissible operating speeds $V_{\max \text{ op.}}$ (V_{MO}) and $M_{\max \text{ op.}}$ (M_{MO}):
 - at altitudes from the ground level up to 7000 m 600km/hour
 - at altitudes from 7000 m up to 9200 m 575km/hour
 - Mach number at altitudes of 9200 m and over 0.82

TO 2.2 GENERAL OPERATIONAL LIMITATIONS

Replace text 2.2.1 (3) “Weather minimum of 30x400m (ICAO Category II) is established for airplane” with the text “2.2.1 The airplane may be operated at the weather minimum of 30x400 m (ICAO Category II).

Takeoff minimum when runway visibility range is 200 m.

NOTES:

1. Take off minimum is applicable when the aerodrome provided with lights of runway axial line in the day and night.
2. When runway axial line lights with axial line marking are absent the aerodrome take off minimum will be 500 m for day time and 700 m for night time.
3. In the event of absence of the lighting equipment the aerodrome take off minimum is equal to landing minimum of the aerodrome concerned.
4. Take off minimum is applicable when there is a standby airfield and flight time from it to the departure aerodrome doesn't exceed two hours.



Ty-154M

SECTION 3

PREPARATION FOR FLIGHT



3.1 Calculations of Flight Data

3.1.1 General

The present section contains the information enabling the crew to perform the preflight calculation of flight data.

The crew must perform such a calculation before each flight.

The calculation of flight data includes the following operations:

- Receiving of initial data for calculation.
- Calculation of the maximum allowable takeoff and landing weights of the airplane.
- Determination of the optimum regimes of flight (in climb, enroute and descent).
- Calculation of the airplane fuel supply.
- Calculation of payload.
- Refinement of the actual takeoff and landing weights.
- Calculation of takeoff and landing speeds.
- Calculation of the airplane CG position and distribution of loads.

3.1.2 Initial Data for Calculation of Flight Data

The necessary initial data for calculation of the flight data are:

- Track distance from the departure to the destination aerodrome and the block time.
- The distance from the destination aerodrome to the most distant alternate aerodrome.
- Wind profile (velocity and direction) for altitude over the route.
- The actual ambient conditions at the departure aerodrome and forecast ambient conditions on the stages of flight, as well as the ambient conditions at the destination and alternate aerodromes (ambient temperature and atmospheric pressure, wind velocity and direction).
- The lengths of runways, stopways and clearways, locations of obstacles, noise limits, condition of the runway surface (friction coefficient, type and amount of atmospheric precipitation) at the departure, destination and alternate aerodromes.
- The airplane operational weight and its CG position as stated in the airplane Log Book.



3.1.3 Selection of Flight Level and Best Enroute Mode of Flight

1. Select the best altitude from Table 3.1.3.1 for the known distance to the destination aerodrome. For distances exceeding 600 km the optimum enroute flight level is the highest possible flight level allowed by the actual gross weight. The best will be the flight level indicated in the Table of a certain direction of flight.
2. The main recommended mode of flight ensuring the lowest fuel consumption is the best-range cruise (BRC). When flying using this mode maintain speeds and Mach numbers which yield the maximum level of specific range. This mode of flight ensures transportation of the maximum payload in conditions where its value is limited by the takeoff weight or the fuel tanks volumetric capacity. To select the Mach number in enroute flight at BRC for the flight level and gross weight refer to paragraph 4.4.2 or subsection 7.5
3. In case of necessity to reduce the block time execute climb, horizontal flight and descent at speeds and Mach numbers of the high-speed cruise (HSC) (Ref. paragraph 4.4.2 or subsection 7.5).
4. The minimum enroute safety speeds at zero flaps and slats are maintained with the following margins above the stalling speeds:
 - 30% at altitudes from zero up to 5000 m and 35% at altitudes above 5000 m (Ref. subsection 7.8).
5. At altitudes of 8400 m and more maintain the speeds not less than those of the best-range cruise mode (Ref. Fig. 7.5.1).



Flight Levels for Flight Distance
Table 3.1.3.1.

Distance, km	Heading			
	0° to 179°	180° to 359°	0° to 179°	180° to 359°
	Flight level		Pressure altitude, m	
bellow 300	190	200	5800	6100
300 to 400	270	280	8250	8550
400 to 500	300	320	9150	9750
500 to 600	330	350	10050	10650
600 and more	380	360 to 390*	11600	10950 to 11900*

NOTES:

1. * It is recommended to maintain a stepped flight profile upon authorization of the ATC service: occupy flight level 390 after the gross weight drops down to 91000 kg provided the distance to go to the destination point is not less than 400 km.
2. It is allowed to occupy a flight level higher than that derived from the Table the outside air temperature and the gross weight so allow and the maximum altitude limits are observed.

3.1.4 Calculation of Required Fuel Supply

1. The fuel supply required for a flight (FS) must be not less than

$$FS = NWF \pm WCF + TF + RF$$

where:

- NWF – fuel used since takeoff up to landing in no-wind conditions;
- WCF - correction accounting for enroute wind (positive in case of headwind);
- TF – fuel used for starting and warming up the engines and taxiing to lineup position (assumed to be equal to 500 kg and in excess of the maximum allowable takeoff weight);
- RF – regulatory fuel reserve determined from the formula below:
 $RF = FR + CF$, where
- FR – fuel reserve required for reaching the alternate aerodrome from the route estimated point with fuel required for holding for the selected period of time included;
- CF – compensation fuel required for compensation of various errors assumed to be equal to 3 % of the main fuel supply (NWF+WCF).



2. Determine NFW, WCF and CF from tables 3.1.4.1 through 3.1.4.31 for the route length (no-wind distance), flight level and mode of flight (Ref. Table 3.1.4.0).

Table 3.1.4.0

Flight level	Pressure altitude, m	Mode of flight			
		BRC	M=0.82	M=0.84	HSC
		Table number			
140	4250	3.1.4.1	—	—	3.1.4.21
200	6100	3.1.4.2	—	—	3.1.4.22
230	7000	3.1.4.3	—	—	3.1.4.23
250	7600	3.1.4.4	—	—	3.1.4.24
270	8250	3.1.4.5	—	—	3.1.4.25
290	8850	3.1.4.6	—	—	3.1.4.26
310	9450	3.1.4.7	3.1.4.12	—	3.1.4.27
330	10050	3.1.4.8	3.1.4.13	3.1.4.17	3.1.4.28
350	10650	3.1.4.9	3.1.4.14	3.1.4.18	3.1.4.29
370	11300	3.1.4.10	3.1.4.15	3.1.4.19	3.1.4.30
390	11900	3.1.4.11	3.1.4.16	3.1.4.20	3.1.4.31

Listed below are the conditions for which the tables are calculated:

- The payload as limited by either the maximum limit payload $MPL = 18000$ kg or the maximum limit takeoff weight $MLTOW = 100000$ kg.
 - The values of NWF are calculated for no-wind conditions ($WV = 0$).
 - The values of WCF are calculated for a wind velocity of 30 km/hr.
 - Fuel used during takeoff for 2 min equals to 600 kg.
 - Fuel used for maneuvering during landing approach and landing for 10 min equals to 600 kg.
 - Fuel used for starting the engines and taxiing to lineup position equal to 500 kg is not included.
3. Determine fuel reserve from Table 3.1.4.32 for the distance between the destination aerodrome and the most distant alternate aerodrome with the selected time of holding in the holding area equal to 30 min.
- CAUTION:** IN CALL CASES THE CALCULATED REGULATORY FUEL RESERVE MUST BE NOT LESS THAN 5000 kg.
4. If the actual payload is less than that assumed in calculation of the tables refine the fuel supply for the BRC mode (Ref. paragraphs 3.1.9 or 7.5.2) within the maximum allowable takeoff weight limits (Ref. paragraph 3.1.5).



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5. If the holding time differs from 30 min, determine the fuel reserve (FR) for the selected holding time (Ref. paragraph 7.5.3).



Table 3.1.4.1

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 140 (4250 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5500	0.535	100	150	1.00
1000	10000	0.535	200	300	1.75
1500	14000	0.545	250	400	2.50
1600	15000	0.545	300	450	2.75
1700	15800	0.545	350	500	2.95
1800	16500	0.545	400	500	3.10
1900	17500	0.545	400	500	3.25
2000	18200	0.545	450	550	3.40
2100	19500	0.55	500	600	3.60
2200	20200	0.55	550	600	3.70
2300	21000	0.55	600	600	3.90
2400	21800	0.55	650	650	4.00
2500	25000	0.55	700	700	4.10
2600	23400	0.55	700	700	4.30
2700	24000	0.55	700	700	4.50
2800	25000	0.55	750	750	4.60
2900	25600	0.55	800	750	4.80
3000	26800	0.55	800	800	5.00
3100	27500	0.55	800	800	5.10
3200	28000	0.545	800	850	5.30
3300	29000	0.545	850	900	5.50
3400	29700	0.545	900	900	5.60
3500	30500	0.545	900	900	5.80
3600	31200	0.545	950	950	5.90
3700	32000	0.545	1000	950	6.00
3800	32900	0.545	1000	1000	6.20
3900	33700	0.545	1000	1000	6.40
4000	34500	0.545	1050	1050	6.50
4100	35500	0.545	1100	1050	6.70
4200	36200	0.545	1100	1100	6.90
4300	37000	0.545	1100	1100	7.00
4400	37800	0.535	1100	1150	7.20
4500	38500	0.535	1100	1150	7.35
4600	39250	0.535	1100	1200	7.50



Table 3.1.4.2

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 200 (6100 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5000	0.60	100	150	0.95
1000	8600	0.60	200	250	1.60
1500	12300	0.61	250	400	2.40
1600	13000	0.61	300	400	2.60
1700	13600	0.61	350	400	2.70
1800	14400	0.61	400	450	2.80
1900	15400	0.61	450	450	3.00
2000	16000	0.61	500	500	3.15
2100	16800	0.61	500	500	3.25
2200	17500	0.61	550	500	3.40
2300	18500	0.62	600	550	3.60
2400	19000	0.62	600	600	3.70
2500	19800	0.62	600	600	3.85
2600	20800	0.62	600	600	4.10
2700	21800	0.62	650	650	4.30
2800	22200	0.62	650	650	4.40
2900	22800	0.62	650	700	4.50
3000	23700	0.62	700	700	4.70
3100	24400	0.62	700	750	4.80
3200	25000	0.62	750	750	4.90
3300	25800	0.62	800	800	5.10
3400	26200	0.62	850	800	5.20
3500	27000	0.62	900	800	5.35
3600	27800	0.62	900	850	5.50
3700	28300	0.60	950	850	5.70
3800	28700	0.60	1000	850	5.80
3900	29500	0.60	1000	900	5.90
4000	30050	0.60	1000	900	6.00
4100	31000	0.60	1050	900	6.30
4200	31500	0.60	1050	950	6.35
4300	32000	0.60	1100	950	6.50
4400	32700	0.60	1100	1000	6.60
4500	33500	0.60	1100	1000	6.80
4600	34000	0.58	1100	1000	6.90
4700	34500	0.58	1100	1050	7.00
4800	35000	0.58	1100	1050	7.10
4900	36000	0.58	1100	1100	7.30
5000	36500	0.58	1100	1000	7.45



Table 3.1.4.3

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 230 (7000 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4700	0.65	150	150	0.96
1000	7600	0.65	200	250	1.60
1500	11100	0.66	250	350	2.25
1600	11750	0.66	300	350	2.40
1700	12500	0.66	350	400	2.50
1800	13250	0.66	400	400	2.65
1900	13800	0.66	400	400	2.75
2000	14500	0.66	450	450	2.90
2100	15200	0.66	450	450	3.04
2200	15900	0.66	450	500	3.18
2300	16700	0.66	500	500	3.35
2400	17500	0.66	500	550	3.45
2500	18100	0.66	500	550	3.65
2600	18800	0.66	550	550	3.75
2700	19500	0.67	600	600	3.85
2800	20200	0.67	650	600	4.00
2900	21000	0.67	700	650	4.13
3000	21700	0.67	750	650	4.25
3100	22500	0.67	800	700	4.40
3200	23200	0.67	800	700	4.55
3300	23900	0.67	800	700	4.65
3400	24500	0.67	800	750	4.80
3500	25200	0.67	800	750	4.95
3600	25800	0.67	800	800	5.10
3700	26500	0.67	850	800	5.25
3800	27100	0.66	850	800	5.40
3900	27800	0.66	900	850	5.55
4000	28400	0.66	900	850	5.70
4100	29000	0.66	900	850	5.85
4200	29700	0.66	900	900	5.95
4300	30200	0.66	900	900	6.10
4400	30800	0.66	900	950	6.20
4500	31500	0.66	950	950	6.35
4600	32100	0.66	950	950	6.45
4700	32700	0.66	950	1000	6.60
4800	33400	0.66	1000	1000	6.75
4900	34000	0.66	1050	1000	6.90
5000	34600	0.66	1000	1050	7.05



Table 3.1.4.4

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 250 (7600 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4600	0.675	150	150	0.85
1000	7550	0.675	200	250	1.58
1500	1900	0.675	300	350	2.23
1600	11600	0.69	350	350	2.38
1700	12250	0.69	350	350	2.48
1800	12800	0.69	350	400	2.62
1900	13350	0.69	350	400	2.72
2000	14100	0.69	400	400	2.88
2100	14700	0.69	450	450	3.02
2200	15350	0.69	450	450	3.15
2300	16050	0.69	450	500	3.32
2400	16600	0.69	500	500	3.43
2500	17300	0.69	500	500	3.60
2600	18000	0.69	550	550	3.70
2700	18650	0.69	550	550	3.80
2800	19350	0.7	550	600	3.85
2900	19950	0.7	600	600	4.00
3000	20550	0.7	600	600	4.10
3100	21200	0.7	600	650	4.25
3200	22000	0.7	650	650	4.40
3300	22700	0.7	700	700	4.50
3400	23400	0.7	700	700	4.65
3500	24000	0.7	700	700	4.80
3600	24600	0.7	700	750	4.90
3700	25200	0.7	750	750	5.10
3800	25800	0.7	800	800	5.15
3900	26400	0.7	800	800	5.30
4000	26900	0.7	800	800	5.40
4100	27400	0.69	850	800	5.70
4200	27900	0.69	900	850	5.82
4300	28400	0.69	900	850	5.92
4400	29000	0.69	900	850	6.05
4500	29600	0.69	900	900	6.20
4600	30100	0.69	900	900	6.33
4700	30700	0.69	900	900	6.50
4800	31400	0.69	950	950	6.60
4900	32000	0.69	1000	950	6.75
5000	32600	0.69	1000	1000	6.85



Table 3.1.4.5

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 270 (8250 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4550	0.7	150	150	0.83
1000	7500	0.7	200	200	1.50
1500	10600	0.7	300	300	2.10
1600	11200	0.7	300	350	2.22
1700	11900	0.715	350	350	2.32
1800	12500	0.715	400	400	2.42
1900	13200	0.715	400	400	2.60
2000	13900	0.715	400	400	2.70
2100	14400	0.715	400	450	2.85
2200	15000	0.715	400	450	2.98
2300	15600	0.715	400	450	3.10
2400	16300	0.715	400	500	3.23
2500	16900	0.715	450	500	3.35
2600	17500	0.715	500	550	3.45
2700	18100	0.715	500	550	3.60
2800	18800	0.715	550	550	3.70
2900	19400	0.73	550	600	3.80
3000	20000	0.73	550	600	3.90
3100	20650	0.73	600	600	4.00
3200	21300	0.73	650	650	4.10
3300	22000	0.73	700	650	4.20
3400	22600	0.73	700	700	4.32
3500	23200	0.73	700	700	4.45
3600	23800	0.73	700	700	4.60
3700	24400	0.73	750	750	4.70
3800	25000	0.73	800	750	4.80
3900	25500	0.73	850	750	4.93
4000	26100	0.73	850	800	5.07
4100	26600	0.73	850	800	5.15
4200	27000	0.715	900	800	5.30
4300	27500	0.715	900	800	5.40
4400	27900	0.715	900	850	5.52
4500	28400	0.715	900	850	5.65
4600	29000	0.715	900	850	5.80
4700	29600	0.715	950	900	5.95
4800	30100	0.715	950	900	6.00
4900	30600	0.715	950	900	6.10
5000	31200	0.715	950	950	6.20



Table 3.1.4.6

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 290 (8850 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4600	0.73	100	150	0.85
1000	7400	0.73	150	200	1.45
1500	10200	0.73	300	300	2.15
1600	11000	0.73	300	350	2.35
1700	11500	0.74	300	350	2.40
1800	12000	0.74	300	350	2.55
1900	13000	0.74	300	400	2.65
2000	13400	0.74	350	400	2.75
2100	14000	0.74	350	400	2.95
2200	14500	0.74	350	450	3.05
2300	15200	0.74	350	450	3.20
2400	15500	0.74	400	450	3.30
2500	16000	0.74	400	500	3.45
2600	16800	0.74	400	500	3.55
2700	17500	0.74	450	500	3.65
2800	18000	0.74	450	500	3.85
2900	18800	0.74	500	550	4.00
3000	19200	0.74	500	600	4.15
3100	20000	0.75	500	600	4.30
3200	20500	0.75	550	600	4.45
3300	21000	0.75	550	600	4.50
3400	21700	0.75	550	650	4.70
3500	22400	0.75	550	700	4.90
3600	23000	0.75	550	700	5.00
3700	23500	0.75	550	700	5.10
3800	24200	0.75	550	700	5.15
3900	24600	0.75	550	700	5.20
4000	25000	0.75	550	750	5.25
4100	25800	0.75	600	800	5.40
4200	26200	0.75	600	800	5.50
4300	26800	0.74	650	800	5.70
4400	27200	0.74	650	800	5.80
4500	28000	0.74	650	850	6.00
4600	28400	0.74	700	850	6.10
4700	29000	0.74	700	900	6.20
4800	29400	0.74	750	900	6.30
4900	30000	0.74	750	900	6.40
5000	30500	0.74	800	900	6.50



Table 3.1.4.7

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 310 (9450 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.755	100	150	0.90
1000	7250	0.755	150	200	1.50
1500	10000	0.755	200	300	2.10
1600	10600	0.755	200	300	2.15
1700	11100	0.755	250	350	2.35
1800	11600	0.765	250	350	2.40
1900	12300	0.765	300	400	2.60
2000	12800	0.765	350	400	2.70
2100	13400	0.765	350	400	2.80
2200	14000	0.765	350	450	2.90
2300	14500	0.765	400	450	3.00
2400	15000	0.765	400	450	3.15
2500	15700	0.765	400	500	3.30
2600	16300	0.765	050	500	3.40
2700	16800	0.765	450	500	3.50
2800	17400	0.765	500	550	3.65
2900	18000	0.765	500	550	3.80
3000	18500	0.765	500	550	3.90
3100	19200	0.765	550	550	4.00
3200	19800	0.775	600	600	4.05
3300	20400	0.775	600	600	4.20
3400	21000	0.775	600	600	4.30
3500	21500	0.775	600	650	4.40
3600	22200	0.775	600	700	4.50
3700	22900	0.775	600	700	4.65
3800	23400	0.775	650	700	4.80
3900	24100	0.775	650	700	4.90
4000	24400	0.775	650	750	5.00
4100	24900	0.775	700	750	5.10
4200	25500	0.775	700	800	5.20
4300	26000	0.775	750	800	5.35
4400	26400	0.775	750	800	5.45
4500	26800	0.765	800	800	5.55
4600	27400	0.765	800	850	5.70
4700	27900	0.765	850	850	5.80
4800	28400	0.765	850	850	5.90
4900	28900	0.765	900	900	6.05
5000	29500	0.765	900	900	6.15



Table 3.1.4.8

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 330 (10050 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4400	0.775	100	150	0.90
1000	6900	0.775	150	200	1.50
1500	9800	0.775	200	300	2.10
1600	10200	0.775	250	300	2.25
1700	10700	0.775	250	350	2.40
1800	11100	0.775	250	350	2.50
1900	11700	0.785	300	350	2.55
2000	12300	0.785	300	400	2.70
2100	12900	0.785	350	400	2.80
2200	13400	0.785	350	400	2.90
2300	14000	0.785	400	450	3.00
2400	14500	0.785	400	450	3.15
2500	15000	0.785	400	450	3.30
2600	15500	0.785	450	500	3.40
2700	16100	0.785	450	500	3.50
2800	16600	0.785	500	500	3.65
2900	17200	0.785	500	550	3.75
3000	17800	0.785	500	550	3.85
3100	18400	0.785	550	550	3.95
3200	18900	0.785	600	600	4.10
3300	19600	0.785	600	600	4.25
3400	20200	0.795	650	600	4.35
3500	20800	0.795	650	650	4.40
3600	21400	0.795	650	650	4.50
3700	29000	0.795	700	650	4.60
3800	22500	0.795	750	700	4.70
3900	23100	0.795	750	700	4.85
4000	23600	0.795	800	700	4.95
4100	24100	0.795	800	750	5.10
4200	24700	0.795	800	750	5.20
4300	25100	0.795	800	750	5.30
4400	25600	0.795	800	800	5.40
4500	26100	0.795	850	800	5.55
4600	26500	0.785	900	800	5.80
4700	27000	0.785	900	800	5.90
4800	27400	0.785	900	850	6.00
4900	27900	0.785	900	850	6.15
5000	28400	0.785	950	850	6.25



Table 3.1.4.9

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 350 (10650 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4400	0.80	100	150	0.90
1000	7000	0.80	200	200	1.55
1500	9600	0.80	250	200	2.10
1600	10100	0.80	250	300	2.25
1700	10600	0.80	300	350	2.40
1800	11100	0.80	300	350	2.45
1900	11600	0.80	300	350	2.60
2000	12200	0.805	300	400	2.70
2100	12800	0.805	350	400	2.80
2200	13300	0.805	350	400	2.90
2300	13800	0.805	400	400	3.0
2400	14300	0.805	400	450	3.15
2500	14800	0.805	450	450	3.30
2600	15300	0.805	500	500	3.35
2700	15900	0.805	500	500	3.50
2800	16400	0.805	500	500	3.55
2900	17000	0.805	550	500	3.75
3000	17600	0.805	550	550	3.80
3100	18100	0.805	550	550	3.90
3200	18600	0.805	600	550	4.0
3300	19200	0.805	600	600	4.15
3400	19700	0.805	650	600	4.30
3500	20300	0.81	650	600	4.30
3600	20900	0.81	650	650	4.45
3700	21500	0.81	650	650	4.55
3800	22000	0.81	700	700	4.70
3900	22600	0.81	700	700	4.80
4000	23200	0.81	700	700	4.90
4100	23700	0.81	700	700	5.0
4200	24100	0.81	700	750	5.15
4300	24600	0.81	750	750	5.30
4400	25000	0.81	750	750	5.40
4500	25500	0.81	750	800	5.50
4600	26000	0.81	750	800	5.60
4700	26500	0.805	750	800	5.80
4800	26900	0.805	750	800	5.90
4900	27300	0.805	800	850	6.05
5000	27800	0.805	800	850	6.15



Table 3.1.4.10

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 370 (11300 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4400	0.805	50	150	0.85
1000	6900	0.805	150	200	1.50
1500	9300	0.805	250	300	2.10
1600	9900	0.805	300	300	2.20
1700	10400	0.805	350	300	2.30
1800	10900	0.805	350	350	2.40
1900	11300	0.805	350	350	2.55
2000	11900	0.805	350	350	2.70
2100	12400	0.81	350	400	2.75
2200	13000	0.81	400	400	2.85
2300	13500	0.81	400	400	2.95
2400	14000	0.81	400	450	3.10
2500	14500	0.81	400	450	3.20
2600	15000	0.81	400	450	3.30
2700	15500	0.81	400	500	3.40
2800	16100	0.81	400	500	3.55
2900	16500	0.81	400	500	3.65
3000	17100	0.81	400	500	3.75
3100	17800	0.81	400	550	3.90
3200	18000	0.81	500	550	4.00
3300	19000	0.81	500	600	4.10
3400	19250	0.81	500	600	4.20
3500	19900	0.81	500	600	4.35
3600	20500	0.81	550	600	4.45
3700	21000	0.81	550	650	4.60
3800	21500	0.81	550	650	4.70
3900	22100	0.81	550	700	4.80
4000	22800	0.81	600	700	4.90
4100	23200	0.81	650	700	5.05
4200	23500	0.81	650	700	5.15
4300	24250	0.81	650	750	5.30
4400	24600	0.81	700	750	5.40
4500	25000	0.81	700	750	5.50
4600	25500	0.81	700	800	5.60
4700	26000	0.81	700	800	5.75
4800	26500	0.81	750	800	5.85
4900	26700	0.81	750	800	5.95
5000	27250	0.81	750	850	6.10



Table 3.1.4.11

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

BEST-RANGE CRUISE FLIGHT LEVEL 390 (11900 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.81	50	150	1.0
1000	6800	0.81	150	200	1.60
1500	9350	0.81	250	300	2.15
1600	9700	0.81	250	300	2.25
1700	10300	0.81	250	300	2.40
1800	10700	0.81	300	350	2.50
1900	11200	0.81	300	350	2.60
2000	11600	0.81	300	350	2.70
2100	12250	0.81	300	400	2.85
2200	12900	0.81	350	400	2.95
2300	13500	0.81	350	400	3.10
2400	14000	0.81	350	450	3.20
2500	14500	0.81	350	450	3.30
2600	15000	0.81	400	450	3.40
2700	15700	0.81	450	500	3.55
2800	16100	0.81	450	500	3.65
2900	16700	0.81	450	500	3.80
3000	17200	0.81	500	550	3.90
3100	17750	0.81	500	550	4.0
3200	18200	0.81	500	550	4.10
3300	19000	0.81	500	600	4.20
3400	19500	0.81	500	600	4.35
3500	20000	0.81	550	600	4.40
3600	20500	0.81	550	600	4.55
3700	21000	0.81	550	650	4.70
3800	21800	0.81	550	650	4.80
3900	22300	0.81	600	700	4.90
4000	23000	0.81	600	700	5.0
4100	23300	0.81	600	700	5.10
4200	23750	0.81	600	700	5.20
4300	24200	0.81	650	750	5.35
4400	24800	0.81	650	750	5.45
4500	25200	0.81	700	750	5.60
4600	25500	0.81	700	800	5.70
4700	26000	0.81	700	800	5.80
4800	26600	0.81	750	800	5.90
4900	27000	0.81	750	800	6.05
5000	27400	0.81	800	850	6.15



Table 3.1.4.12

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.82$ FLIGHT LEVEL 310 (9450 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4700	0.82	100	150	0.87
1000	7450	0.82	150	250	1.42
1500	10300	0.82	200	300	1.95
1600	10900	0.82	200	350	2.12
1700	11500	0.82	250	350	2.22
1800	12000	0.82	300	350	2.30
1900	12700	0.82	350	400	2.40
2000	13200	0.82	400	400	2.50
2100	13900	0.82	400	450	2.60
2200	14200	0.82	400	450	2.71
2300	14900	0.82	450	450	2.82
2400	15500	0.82	450	500	2.92
2500	16200	0.82	450	500	3.08
2600	16800	0.82	450	500	3.20
2700	17200	0.82	450	500	3.30
2800	18000	0.82	500	550	3.45
2900	18600	0.82	500	550	3.55
3000	19100	0.82	500	600	3.66
3100	19800	0.82	550	600	3.82
3200	20300	0.82	600	600	3.92
3300	21000	0.82	600	600	4.02
3400	21500	0.82	600	650	4.13
3500	22200	0.82	600	700	4.23
3600	22900	0.82	600	700	4.30
3700	23500	0.82	600	700	4.46
3800	24000	0.82	650	700	4.62
3900	24500	0.82	650	700	4.70
4000	25000	0.82	650	750	4.80
4100	25400	0.82	700	750	4.95
4200	26000	0.82	700	800	5.00
4300	26500	0.82	750	800	5.15
4400	27000	0.82	750	800	5.25
4500	27500	0.82	800	800	5.38
4600	28000	0.82	850	850	5.50
4700	25600	0.82	850	850	5.60
4800	29000	0.82	850	900	5.70
4900	29800	0.82	900	900	5.78
5000	30200	0.82	900	900	5.90



Table 3.1.4.13

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.82$ FLIGHT LEVEL 330 (10050 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.82	150	150	0.9
1000	7100	0.82	200	200	1.43
1500	9950	0.82	300	300	1.97
1600	10400	0.82	350	300	2.12
1700	10950	0.82	350	350	2.23
1800	11500	0.82	400	350	2.33
1900	12050	0.82	400	350	2.43
2000	12650	0.82	450	400	2.52
2100	13250	0.82	450	400	2.62
2200	13750	0.82	450	400	2.72
2300	14300	0.82	450	450	2.83
2400	14850	0.82	450	450	2.93
2500	15400	0.82	450	450	3.09
2600	15900	0.82	450	500	3.22
2700	16500	0.82	450	500	3.35
2800	17050	0.82	450	500	3.47
2900	17650	0.82	500	550	3.58
3000	18250	0.82	550	550	3.68
3100	18900	0.82	550	550	3.84
3200	19400	0.82	550	600	3.93
3300	20000	0.82	600	600	4.06
3400	20500	0.82	600	600	4.15
3500	21100	0.82	600	650	4.25
3600	21700	0.82	600	650	4.35
3700	22300	0.82	600	700	4.48
3800	22950	0.82	650	700	4.63
3900	23450	0.82	650	700	4.72
4000	24000	0.82	700	700	4.82
4100	24500	0.82	700	750	4.97
4200	25100	0.82	700	750	5.05
4300	25600	0.82	700	750	5.20
4400	26000	0.82	700	800	5.30
4500	26600	0.82	750	800	5.40
4600	27100	0.82	800	800	5.52
4700	27600	0.82	800	850	5.62
4800	28000	0.82	800	850	5.75
4900	28500	0.82	800	850	5.85
5000	29000	0.82	850	850	5.95



Table 3.1.4.14

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.82$ FLIGHT LEVEL 350 (10650 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4450	0.82	50	150	0.93
1000	7000	0.82	150	200	1.44
1500	9600	0.82	250	300	1.99
1600	10100	0.82	300	300	2.14
1700	10700	0.82	300	300	2.24
1800	11300	0.82	300	350	2.34
1900	11800	0.82	300	350	2.44
2000	12300	0.82	300	400	2.54
2100	12800	0.82	300	400	2.64
2200	13400	0.82	350	400	2.74
2300	13900	0.82	350	400	2.84
2400	14400	0.82	400	450	2.94
2500	15000	0.82	400	450	3.10
2600	15500	0.82	450	450	3.24
2700	16050	0.82	450	500	3.38
2800	16600	0.82	500	500	3.50
2900	17200	0.82	500	500	3.60
3000	17750	0.82	550	550	3.70
3100	18300	0.82	550	550	3.85
3200	18900	0.82	550	550	3.95
3300	19500	0.82	600	600	4.08
3400	20000	0.82	600	600	4.17
3500	20500	0.82	600	600	4.28
3600	21000	0.82	600	650	4.38
3700	21650	0.82	650	650	4.49
3800	22250	0.82	650	650	4.64
3900	22800	0.82	700	700	4.74
4000	23300	0.82	700	700	4.84
4100	23800	0.82	700	700	4.99
4200	24300	0.82	700	750	5.08
4300	24800	0.82	700	750	5.23
4400	25200	0.82	700	750	5.35
4500	25800	0.82	700	800	5.45
4600	26200	0.82	700	800	5.54
4700	26800	0.82	700	800	5.64
4800	27200	0.82	750	800	5.78
4900	27600	0.82	750	850	5.88
5000	28100	0.82	750	850	5.98



Table 3.1.4.15

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.82$ FLIGHT LEVEL 370 (11300 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4400	0.82	50	150	0.85
1000	6900	0.82	150	200	1.45
1500	9300	0.82	250	300	2.00
1600	10000	0.82	300	300	2.15
1700	10400	0.82	350	300	2.25
1800	11000	0.82	350	350	2.35
1900	11500	0.82	350	350	2.45
2000	12000	0.82	350	350	2.55
2100	12500	0.82	400	400	2.65
2200	13000	0.82	400	400	2.75
2300	13500	0.82	400	400	2.85
2400	14050	0.82	400	450	2.95
2500	14600	0.82	400	450	3.10
2600	15050	0.82	450	450	3.25
2700	15500	0.82	450	500	3.40
2800	16250	0.82	450	500	3.50
2900	16600	0.82	450	500	3.60
3000	17200	0.82	450	500	3.70
3100	17850	0.82	450	550	3.85
3200	18400	0.82	500	550	4.00
3300	19000	0.82	500	600	4.10
3400	19400	0.82	500	600	4.25
3500	20100	0.82	500	600	4.30
3600	20650	0.82	550	600	4.40
3700	21200	0.82	550	650	4.50
3800	21600	0.82	550	650	4.65
3900	22500	0.82	600	700	4.75
4000	23000	0.82	600	700	4.85
4100	23500	0.82	600	700	5.00
4200	24000	0.82	600	700	5.10
4300	24400	0.82	650	700	5.25
4400	24900	0.82	700	750	5.40
4500	25300	0.82	700	750	5.50
4600	25700	0.82	700	800	5.55
4700	26100	0.82	700	800	5.65
4800	26700	0.82	750	800	5.80
4900	27000	0.82	750	800	5.90
5000	27500	0.82	750	850	6.00



Table 3.1.4.16

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.82$ FLIGHT LEVEL 390 (11900 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.82	50	150	0.95
1000	6850	0.82	150	200	1.45
1500	9500	0.82	200	300	2.00
1600	9900	0.82	250	300	2.15
1700	10400	0.82	250	300	2.25
1800	10800	0.82	300	300	2.35
1900	11300	0.82	300	350	2.42
2000	11800	0.82	300	350	2.55
2100	12350	0.82	300	400	2.65
2200	12800	0.82	350	400	2.75
2300	13400	0.82	350	400	2.85
2400	14100	0.82	350	400	2.95
2500	14600	0.82	350	450	3.10
2600	15000	0.82	400	450	3.25
2700	15750	0.82	450	500	3.40
2800	16200	0.82	450	500	3.50
2900	16800	0.82	450	500	3.60
3000	17300	0.82	500	500	3.70
3100	17900	0.82	500	550	3.85
3200	18300	0.82	500	550	4.00
3300	19100	0.82	500	600	4.10
3400	16900	0.82	500	600	4.25
3500	20150	0.82	550	600	4.30
3600	20600	0.82	550	600	4.40
3700	21200	0.82	550	650	4.50
3800	21900	0.82	550	650	4.65
3900	22500	0.82	600	700	4.75
4000	23050	0.82	600	700	4.85
4100	23400	0.82	600	700	5.00
4200	23900	0.82	650	700	5.10
4300	24350	0.82	700	700	5.25
4400	24800	0.82	700	750	5.40
4500	25300	0.82	700	750	5.50
4600	25600	0.82	700	800	5.55
4700	26100	0.82	700	800	5.65
4800	26700	0.82	750	800	5.80
4900	27050	0.82	750	800	5.90
5000	27500	0.82	800	800	6.00



Table 3.1.4.17

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.84$ FLIGHT LEVEL 330 (10050 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4600	0.84	150	150	0.80
1000	7200	0.84	200	200	1.38
1500	10100	0.84	300	300	1.88
1600	10600	0.84	300	300	2.05
1700	11100	0.84	300	350	2.18
1800	11700	0.84	350	350	2.23
1900	12250	0.84	350	400	2.34
2000	12800	0.84	350	400	2.44
2100	13400	0.84	350	400	2.54
2200	14000	0.84	400	400	2.70
2300	14500	0.84	400	450	2.80
2400	15100	0.84	400	450	2.90
2500	15700	0.84	400	450	3.05
2600	16200	0.84	400	500	3.15
2700	16800	0.84	450	500	3.25
2800	17400	0.84	450	500	3.38
2900	18000	0.84	500	550	3.50
3000	18600	0.84	550	550	3.60
3100	19250	0.84	550	600	3.70
3200	19800	0.84	550	600	3.85
3300	20400	0.84	600	600	3.93
3400	21000	0.84	600	650	4.00
3500	21600	0.84	600	650	4.10
3600	22200	0.84	650	650	4.18
3700	22900	0.84	700	700	4.30
3800	23400	0.84	700	700	4.50
3900	24000	0.84	700	700	4.55
4000	24400	0.84	700	750	4.70
4100	25000	0.84	750	750	4.80
4200	25500	0.84	750	750	4.85
4300	26000	0.84	750	800	5.00
4400	26600	0.84	800	800	5.15
4500	27000	0.84	800	800	5.25
4600	27500	0.84	800	850	5.35
4700	28000	0.84	800	850	5.50
4800	28600	0.84	800	850	5.60
4900	29000	0.84	800	850	5.70
5000	29600	0.84	800	900	5.80



Table 3.1.4.18

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.84$ FLIGHT LEVEL 350 (10650 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4550	0.84	100	150	0.80
1000	7100	0.84	150	200	1.38
1500	9800	0.84	200	300	1.88
1600	10300	0.84	300	300	2.05
1700	10850	0.84	350	350	2.18
1800	11400	0.84	350	350	2.23
1900	11900	0.84	350	350	2.34
2000	12500	0.84	350	400	2.44
2100	13000	0.84	350	400	2.54
2200	13600	0.84	400	400	2.70
2300	14100	0.84	400	400	2.80
2400	14700	0.84	450	450	2.90
2500	15300	0.84	450	450	3.05
2600	15800	0.84	450	500	3.15
2700	16300	0.84	500	500	3.25
2800	16900	0.84	500	500	3.38
2900	17500	0.84	500	550	3.50
3000	18100	0.84	500	550	3.60
3100	18650	0.84	550	550	3.70
3200	19200	0.84	550	600	3.85
3300	19750	0.84	550	600	3.93
3400	20300	0.84	550	600	4.00
3500	20900	0.84	600	650	4.13
3600	21500	0.84	600	650	4.20
3700	22100	0.84	600	650	4.30
3800	22700	0.84	650	700	4.50
3900	23200	0.84	650	700	4.55
4000	23700	0.84	650	700	4.70
4100	24200	0.84	650	750	4.80
4200	24700	0.84	650	750	4.85
4300	25200	0.84	650	750	5.00
4400	25700	0.84	700	750	5.15
4500	26200	0.84	700	800	5.25
4600	26700	0.84	700	800	5.35
4700	27200	0.84	700	800	5.50
4800	27700	0.84	700	850	5.60
4900	28200	0.84	750	850	5.70
5000	28700	0.84	800	850	5.80



Table 3.1.4.19

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.84$ FLIGHT LEVEL 370 (11300 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.84	50	150	0.85
1000	7000	0.84	200	200	1.40
1500	9500	0.84	300	300	1.90
1600	10200	0.84	350	300	2.10
1700	10600	0.84	350	300	2.20
1800	11200	0.84	350	350	2.25
1900	11700	0.84	350	350	2.35
2000	12250	0.84	350	350	2.45
2100	12800	0.84	400	400	2.55
2200	13400	0.84	400	400	2.71
2300	13800	0.84	400	400	2.81
2400	14400	0.84	400	450	2.91
2500	14950	0.84	400	450	3.07
2600	15400	0.84	450	450	3.17
2700	16000	0.84	450	500	3.27
2800	16500	0.84	450	500	3.40
2900	17100	0.84	450	500	3.52
3000	17700	0.84	450	500	3.65
3100	18100	0.84	500	550	3.80
3200	18700	0.84	500	550	3.90
3300	19200	0.84	500	600	3.95
3400	19900	0.84	500	600	4.10
3500	20400	0.84	500	600	4.15
3600	21000	0.84	550	600	4.25
3700	21500	0.84	550	650	4.45
3800	22100	0.84	550	650	4.55
3900	22700	0.84	600	650	4.65
4000	23200	0.84	600	700	4.75
4100	23800	0.84	600	700	4.85
4200	24200	0.84	600	700	4.90
4300	24800	0.84	650	750	5.05
4400	25200	0.84	700	750	5.20
4500	25800	0.84	700	750	5.35
4600	26200	0.84	700	800	5.45
4700	26500	0.84	700	800	5.55
4800	27000	0.84	750	800	5.65
4900	27500	0.84	750	800	5.75
5000	28000	0.84	750	850	5.85



Table 3.1.4.20

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

CRUISING SPEED, $M = 0.84$ FLIGHT LEVEL 390 (11900 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4500	0.84	50	150	0.85
1000	6900	0.84	150	200	1.40
1500	9550	0.84	200	250	1.90
1600	10000	0.84	300	300	2.10
1700	10500	0.84	300	300	2.25
1800	10950	0.84	300	300	2.25
1900	11400	0.84	300	350	2.35
2000	12000	0.84	300	350	2.45
2100	12500	0.84	350	400	2.55
2200	13000	0.84	400	400	2.71
2300	13600	0.84	400	400	2.81
2400	14200	0.84	450	400	2.91
2500	14600	0.84	450	450	3.07
2600	15200	0.84	450	450	3.17
2700	15900	0.84	450	500	3.27
2800	16400	0.84	450	500	3.40
2900	17000	0.84	500	500	3.52
3000	17450	0.84	500	500	3.65
3100	18050	0.84	500	550	3.80
3200	18500	0.84	500	550	3.90
3300	19250	0.84	500	600	3.95
3400	19800	0.84	500	600	4.10
3500	20200	0.84	500	600	4.15
3600	21000	0.84	550	650	4.25
3700	21400	0.84	550	650	4.45
3800	22000	0.84	550	660	4.55
3900	22600	0.84	600	680	4.65
4000	23000	0.84	600	700	4.75
4100	23600	0.84	600	700	4.85
4200	24000	0.84	600	700	4.90
4300	24500	0.84	650	750	5.05
4400	25000	0.84	650	750	5.20
4500	25500	0.84	650	750	5.35
4600	25800	0.84	650	800	5.45
4700	26300	0.84	700	800	5.55
4800	26800	0.84	700	800	5.65
4900	27200	0.84	750	800	5.75
5000	28000	0.84	750	850	5.85



Table 3.1.4.21

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 140 (4250 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5500	0.625	100	150	0.80
1000	1000	0.625	200	300	1.60
1500	14000	0.625	300	400	2.30
1600	15000	0.625	400	450	2.45
1700	15800	0.625	450	500	2.55
1800	16900	0.625	500	500	2.70
1900	17500	0.625	500	500	2.85
2000	18700	0.625	500	550	3.00
2100	19500	0.625	600	600	3.15
2200	20500	0.625	600	600	3.35
2300	21400	0.625	600	650	3.40
2400	22500	0.625	650	700	3.60
2500	23500	0.625	650	700	3.75
2600	24200	0.625	700	700	3.80
2700	25000	0.625	700	750	4.00
2800	25800	0.625	700	800	4.15
2900	26900	0.625	750	800	4.30
3000	27400	0.625	750	800	4.45
3100	28200	0.625	800	850	4.60
3200	29000	0.625	800	900	4.70
3300	30000	0.625	850	900	4.85
3400	31000	0.625	900	900	5.00
3500	31600	0.625	900	950	5.15
3600	32500	0.625	950	1000	5.30
3700	33500	0.625	1000	1000	5.40
3800	34600	0.625	1100	1050	5.60
3900	35200	0.625	1100	1050	5.80
4000	36000	0.625	1200	1100	5.90
4100	36800	0.625	1200	1100	6.00
4200	37600	0.625	1200	1100	6.10
4300	38500	0.625	1200	1150	6.30
4400	39250	0.625	1200	1200	6.40



Table 3.1.4.22

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 200 (6100 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5200	0.7	150	150	0.87
100	9000	0.7	200	250	1.50
1500	12700	0.7	350	400	2.10
1600	13500	0.7	400	400	2.22
1700	14400	0.7	450	450	2.35
1800	15150	0.7	450	450	2.50
1900	16000	0.7	500	500	2.60
2000	16800	0.7	500	500	2.70
2100	17500	0.7	500	550	2.82
2200	18300	0.7	500	550	2.98
2300	19000	0.7	500	550	3.10
2400	19700	0.7	550	600	3.20
2500	20500	0.7	550	600	3.30
2600	21300	0.7	600	650	3.45
2700	22100	0.7	650	650	3.60
2800	22900	0.7	650	700	3.70
2900	23600	0.7	700	700	3.80
3000	24400	0.7	750	750	3.95
3100	25050	0.7	750	750	4.05
3200	25800	0.7	800	750	4.20
3300	26500	0.7	800	800	4.30
3400	27200	0.7	850	800	4.40
3500	27900	0.7	900	850	4.55
3600	28600	0.7	900	850	4.68
3700	29400	0.7	950	900	4.80
3800	30100	0.7	1000	900	4.92
3900	30900	0.7	1050	950	5.05
4000	31700	0.7	1100	950	5.20
4100	32400	0.7	1100	950	5.30
4200	33000	0.7	1100	1000	5.42
4300	33700	0.7	1100	1000	5.60
4400	34350	0.7	1100	1050	5.70
4500	35150	0.7	1150	1050	5.80
4600	35900	0.7	1200	1100	5.95
4700	36600	0.7	1200	1100	6.10
4800	37300	0.7	1200	1100	6.20
4900	38000	0.7	1200	1150	6.30
5000	38600	0.7	1200	1150	6.44



Table 3.1.4.23

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 230 (7000 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5000	0.74	100	150	0.75
1000	8500	0.74	150	250	1.40
1500	12000	0.74	200	250	1.90
1600	12800	0.74	250	400	2.10
1700	13300	0.74	250	400	2.20
1800	14000	0.74	300	400	2.30
1900	14800	0.74	300	450	2.50
2000	15500	0.74	300	450	2.60
2100	16500	0.74	350	500	2.70
2200	17000	0.74	350	500	2.90
2300	17500	0.74	400	550	3.00
2400	18200	0.74	400	550	3.10
2500	19000	0.74	400	600	3.20
2600	19700	0.74	400	600	3.30
2700	20500	0.74	400	600	3.40
2800	21000	0.74	400	600	3.50
2900	22000	0.74	450	650	3.70
3000	22700	0.74	450	700	3.80
3100	23100	0.74	450	700	3.90
3200	24000	0.74	500	700	4.15
3300	24800	0.74	500	750	4.25
3400	25400	0.74	500	750	4.35
3500	26000	0.74	600	800	4.50
3600	26800	0.74	700	800	4.55
3700	27200	0.74	700	800	4.75
3800	28000	0.74	750	850	4.85
3900	28600	0.74	750	850	4.90
4000	29400	0.74	750	900	5.00
4100	30000	0.74	800	900	5.25
4200	30500	0.74	800	900	5.35
4300	31300	0.74	800	950	5.50
4400	31900	0.74	850	950	5.60
4500	32500	0.74	850	1000	5.70
4600	33000	0.74	850	1000	5.80
4700	33800	0.74	900	1000	5.95
4800	34300	0.74	900	1000	6.10
4900	35000	0.74	900	1000	6.20
5000	35800	0.74	900	1050	6.30



Table 3.1.4.24

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 250 (7600 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	5000	0.74	100	150	0.80
1000	8000	0.74	150	250	1.40
1500	11200	0.74	200	300	2.00
1600	12000	0.74	200	350	2.20
1700	12500	0.74	250	400	2.30
1800	13000	0.74	250	400	2.35
1900	14000	0.74	300	400	2.50
2000	14600	0.74	300	400	2.65
2100	15300	0.74	300	450	2.80
2200	15800	0.74	350	500	2.90
2300	16500	0.74	350	500	3.05
2400	17200	0.74	400	500	3.15
2500	18000	0.74	400	500	3.25
2600	18800	0.74	400	550	3.40
2700	19400	0.74	400	600	3.50
2800	20000	0.74	400	600	3.55
2900	20700	0.74	400	650	3.75
3000	21200	0.74	450	650	3.85
3100	21800	0.74	450	650	3.95
3200	22600	0.74	500	700	4.10
3300	23200	0.74	500	700	4.20
3400	24000	0.74	500	700	4.30
3500	24500	0.74	500	700	4.45
3600	25000	0.74	550	750	4.50
3700	25500	0.74	550	750	4.70
3800	26100	0.74	550	800	4.80
3900	27000	0.74	550	800	4.90
4000	27500	0.74	600	800	5.00
4100	28000	0.74	600	800	5.20
4200	28700	0.74	600	850	5.30
4300	29300	0.74	650	900	5.40
4400	30000	0.74	650	900	5.50
4500	30500	0.74	700	900	5.60
4600	31000	0.74	700	900	5.75
4700	31800	0.74	700	950	5.90
4800	32200	0.74	750	950	6.00
4900	33000	0.74	750	1000	6.10
5000	33500	0.74	750	1000	6.20



Table 3.1.4.25

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 270 (8250 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4800	0.77	100	150	0.80
1000	7900	0.77	150	250	1.35
1500	11000	0.77	200	300	1.95
1600	11600	0.77	250	350	2.10
1700	12200	0.77	300	350	2.20
1800	13000	0.77	300	400	2.30
1900	13500	0.77	300	400	2.40
2000	14000	0.77	300	400	2.50
2100	14700	0.77	350	450	2.70
2200	15500	0.77	350	450	2.80
2300	16100	0.77	400	500	2.90
2400	16800	0.77	400	500	3.00
2500	17400	0.77	400	500	3.10
2600	18000	0.77	400	550	3.20
2700	18800	0.77	400	550	3.40
2800	19300	0.77	450	600	3.50
2900	20000	0.77	450	600	3.60
3000	20800	0.77	500	600	3.70
3100	21400	0.77	500	650	3.80
3200	22000	0.77	500	650	3.95
3300	22800	0.77	500	700	4.00
3400	23300	0.77	500	700	4.25
3500	24000	0.77	550	700	4.35
3600	24400	0.77	550	700	4.45
3700	25000	0.77	550	750	4.55
3800	25500	0.77	600	750	4.65
3900	26250	0.77	600	800	4.76
4000	26800	0.77	650	800	4.90
4100	27400	0.77	650	800	5.00
4200	28000	0.77	650	800	5.15
4300	28500	0.77	700	850	5.25
4400	29200	0.77	700	900	5.35
4500	29800	0.77	700	900	5.40
4600	30250	0.77	700	900	5.50
4700	31000	0.77	750	900	5.60
4800	31500	0.77	750	950	5.80
4900	32000	0.77	750	950	5.90
5000	32500	0.77	750	1000	6.00



Table 3.1.4.26

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 290 (8850 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4600	0.8	100	150	0.80
1000	7550	0.8	200	250	1.35
1500	10600	0.8	250	300	1.95
1600	11200	0.8	300	350	2.05
1700	11800	0.8	350	350	2.15
1800	12400	0.8	350	350	2.30
1900	13000	0.8	400	400	2.43
2000	13600	0.8	400	400	2.55
2100	14250	0.8	450	450	2.65
2200	14900	0.8	450	450	2.75
2300	15500	0.8	500	450	2.85
2400	16100	0.8	500	500	3.0
2500	16700	0.8	550	500	3.10
2600	17300	0.8	550	500	3.20
2700	17950	0.8	550	550	3.30
2800	18600	0.8	600	550	3.45
2900	19200	0.8	600	600	3.55
3000	19800	0.8	650	600	3.65
3100	20400	0.8	650	600	3.80
3200	21050	0.8	700	650	3.90
3300	21700	0.8	700	650	4.05
3400	22350	0.8	700	650	4.15
3500	23000	0.8	700	700	4.30
3600	23600	0.8	700	700	4.40
3700	24200	0.8	700	750	4.50
3800	24800	0.8	750	750	4.60
3900	25300	0.8	750	750	4.75
4000	25800	0.8	750	800	4.85
4100	26400	0.8	750	800	4.95
4200	27000	0.8	800	800	5.10
4300	27500	0.8	800	850	5.20
4400	28100	0.8	800	850	5.30
4500	28600	0.8	800	850	5.45
4600	29200	0.8	850	900	5.55
4700	29700	0.8	850	900	5.70
4800	30300	0.8	900	900	5.80
4900	30900	0.8	900	950	6.90
5000	31400	0.8	950	950	6.0



Table 3.1.4.27

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 310 (9450 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4700	0.83	100	150	0.80
1000	7500	0.83	150	250	1.38
1500	10500	0.83	200	300	1.88
1600	11000	0.83	200	300	2.05
1700	11600	0.83	250	350	2.18
1800	12200	0.83	300	350	2.23
1900	12900	0.83	350	400	2.34
2000	13400	0.83	400	400	2.44
2100	14000	0.83	400	400	2.54
2200	14600	0.83	450	450	2.70
2300	15100	0.83	450	450	2.80
2400	15800	0.83	450	500	2.90
2500	16500	0.83	450	500	3.05
2600	17000	0.83	450	500	3.15
2700	17500	0.83	500	500	3.25
2800	18000	0.83	500	550	3.38
2900	18800	0.83	500	550	3.50
3000	19500	0.83	500	600	3.60
3100	20050	0.83	550	600	3.70
3200	20700	0.83	600	600	3.85
3300	21250	0.83	600	650	3.93
3400	21800	0.83	600	650	4.00
3500	22500	0.83	650	700	4.13
3600	23200	0.83	650	700	4.20
3700	23700	0.83	650	700	4.30
3800	24200	0.83	650	700	4.50
3900	24900	0.83	700	750	4.55
4000	25500	0.83	700	750	4.70
4100	26000	0.83	700	800	4.80
4200	26500	0.83	700	800	4.85
4300	27000	0.83	750	800	5.00
4400	27500	0.83	750	800	5.15
4500	28000	0.83	800	850	5.25
4600	28600	0.83	850	850	5.35
4700	29100	0.83	850	900	5.50
4800	29800	0.83	850	900	5.60
4900	30200	0.83	900	900	5.70
5000	30800	0.83	900	900	5.80



Table 3.1.4.28

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 330 (10050 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4700	0.865	150	150	0.75
1000	7400	0.865	200	200	1.30
1500	10400	0.865	300	300	1.80
1600	11000	0.865	300	350	1.98
1700	11500	0.865	350	350	2.08
1800	12050	0.865	350	350	2.21
1900	12600	0.865	350	400	2.31
2000	13200	0.865	350	400	2.41
2100	13800	0.865	400	400	2.52
2200	14400	0.865	400	450	2.62
2300	15000	0.865	450	450	2.72
2400	15500	0.865	450	450	2.82
2500	16200	0.865	500	500	2.93
2600	16750	0.865	500	500	3.08
2700	17400	0.865	500	550	3.20
2800	18000	0.865	500	550	3.32
2900	18700	0.865	550	550	3.42
3000	19300	0.865	550	600	3.52
3100	20000	0.865	550	600	3.60
3200	20500	0.865	550	600	3.72
3300	21200	0.865	600	650	3.84
3400	21900	0.865	650	650	3.92
3500	22500	0.865	650	700	4.03
3600	23000	0.865	650	700	4.13
3700	23700	0.865	700	700	4.25
3800	24300	0.865	700	750	4.35
3900	24800	0.865	700	750	4.44
4000	25300	0.865	700	750	4.60
4100	25800	0.865	750	800	4.68
4200	26400	0.865	750	800	4.78
4300	26900	0.865	750	800	4.93
4400	27500	0.865	800	850	5.03
4500	28000	0.865	800	850	5.13
4600	28500	0.865	800	850	5.23
4700	29000	0.865	800	850	5.68
4800	29600	0.865	800	900	5.48
4900	30100	0.865	800	900	5.58
5000	30600	0.865	800	900	5.68



Table 3.1.4.29

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 350 (10650 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4700	0.87	100	150	0.73
1000	7400	0.87	150	250	1.28
1500	10200	0.87	200	300	1.78
1600	10650	0.87	250	300	1.95
1700	11300	0.87	300	350	2.05
1800	11800	0.87	300	350	2.20
1900	12400	0.87	350	350	2.30
2000	13000	0.87	350	400	2.40
2100	13600	0.87	350	400	2.50
2200	14100	0.87	350	400	2.60
2300	14700	0.87	350	450	2.70
2400	15300	0.87	350	450	2.80
2500	15900	0.87	400	500	2.92
2600	16550	0.87	400	500	3.05
2700	17100	0.87	450	500	3.18
2800	17750	0.87	450	550	3.30
2900	18300	0.87	500	550	3.40
3000	18900	0.87	500	550	3.50
3100	19500	0.87	500	600	3.58
3200	20050	0.87	550	600	3.70
3300	20700	0.87	550	600	3.82
3400	21300	0.87	600	650	3.90
3500	21900	0.87	650	650	4.01
3600	22550	0.87	650	700	4.12
3700	23100	0.87	650	700	4.23
3800	23700	0.87	700	700	4.34
3900	24200	0.87	700	700	4.43
4000	24700	0.87	700	750	4.55
4100	25200	0.87	700	750	4.67
4200	25700	0.87	700	750	4.77
4300	26200	0.87	700	800	4.90
4400	26800	0.87	700	800	5.00
4500	27400	0.87	700	800	5.12
4600	28000	0.87	750	850	5.20
4700	28500	0.87	750	850	5.35
4800	29000	0.87	800	850	5.45
4900	29400	0.87	800	900	5.55
5000	29900	0.87	800	900	5.65



Table 3.1.4.30

Mach Number, Fuel Used (NWF), Compensation Fuel (CF), Block Time (BT) for No-wind Distance (NWD) and Flight Level with Wind Correction (WCF) Included

HIGH-SPEED CRUISE FLIGHT LEVEL 370 (11300 m)

NWD, km	NWF, kg	Mach number	WCF, kg	CF, kg	BT, hr
500	4450	0.87	50	150	0.78
1000	7200	0.87	150	200	1.35
1500	9900	0.87	300	300	1.85
1600	10500	0.87	300	300	2.00
1700	11250	0.87	350	350	2.10
1800	11600	0.87	350	350	2.22
1900	12050	0.87	400	350	2.33
2000	12700	0.87	400	400	2.43
2100	13200	0.87	400	400	2.53
2200	13900	0.87	400	400	2.65
2300	14400	0.87	400	450	2.75
2400	14900	0.87	450	450	2.85
2500	15500	0.87	450	450	2.95
2600	16000	0.87	450	500	3.10
2700	16600	0.87	450	500	3.22
2800	17300	0.87	500	500	3.35
2900	17800	0.87	500	500	3.45
3000	18500	0.87	500	550	3.55
3100	18900	0.87	550	550	3.65
3200	19350	0.87	600	550	3.75
3300	20000	0.87	600	600	3.85
3400	20500	0.87	600	600	3.93
3500	21100	0.87	650	600	4.05
3600	22100	0.87	650	650	4.15
3700	22800	0.87	700	700	4.25
3800	23200	0.87	700	700	4.40
3900	23700	0.87	700	700	4.45
4000	24400	0.87	700	700	4.65
4100	24700	0.87	750	750	4.70
4200	25200	0.87	750	750	4.80
4300	25800	0.87	800	750	4.95
4400	26150	0.87	800	800	5.05
4500	26500	0.87	800	800	5.15
4600	27000	0.87	800	800	5.25
4700	27500	0.87	800	800	5.40
4800	28000	0.87	800	850	5.50
4900	28500	0.87	800	850	5.60
5000	29000	0.87	800	900	5.70



table 3.1.4.31

mach number, fuel used (nwf), compensation fuel (cf), block time (bt) for no-wind
distance (nwd) and flight level with wind correction (wcf) included

high-speed cruise flight level 390 (11900 m)

nwd, km	nwf, kg	mach number	wcf, kg	cf, kg	bt, hr
500	4500	0.87	50	150	0.78
1000	7200	0.87	200	200	1.33
1500	9800	0.87	200	300	1.83
1600	10200	0.87	250	300	2.00
1700	10700	0.87	250	300	2.10
1800	11300	0.87	300	350	2.22
1900	11800	0.87	300	350	2.32
2000	12400	0.87	350	400	2.42
2100	13000	0.87	400	400	2.53
2200	13500	0.87	400	400	2.65
2300	14000	0.87	400	400	2.75
2400	14500	0.87	450	400	2.85
2500	15100	0.87	450	450	2.95
2600	15600	0.87	450	450	3.10
2700	16300	0.87	500	500	3.22
2800	17000	0.87	500	500	3.35
2900	17500	0.87	500	500	3.45
3000	18000	0.87	500	550	3.55
3100	18400	0.87	500	550	3.65
3200	19000	0.87	500	600	3.75
3300	19700	0.87	500	600	3.85
3400	20200	0.87	500	600	3.93
3500	20900	0.87	500	600	4.05
3600	21400	0.87	550	600	4.15
3700	22000	0.87	550	650	4.25
3800	22750	0.87	550	700	4.40
3900	23150	0.87	600	700	4.45
4000	23800	0.87	600	700	4.65
4100	24200	0.87	650	700	4.70
4200	24800	0.87	650	750	4.80
4300	25200	0.87	650	750	4.95
4400	25500	0.87	700	750	5.05
4500	26000	0.87	700	800	5.15
4600	26500	0.87	700	800	5.25
4700	26900	0.87	700	800	5.40
4800	27400	0.87	750	800	5.50
4900	28000	0.87	750	850	5.60
5000	28300	0.87	750	850	5.70



table 3.1.4.32

Fuel Reserve (FR) for Distance from Destination Aerodrome to Alternate Aerodrome

Distance to alternate aerodrome	Heading				Mach Number in horizontal flight	Landing weight at destination aerodrome, kg		
	0 to 179°	180 to 359°	0 to 179°	180 to 359°		70000	75000	80000
	Flight level		Pressure altitude, m			Fuel reserve, kg		
To 100	130	140	3950	4250	0.535	4200	4300	4400
150	170	180	5200	5500	0.56	4300	4400	4500
200	190	200	5800	6100	0.60	4620	4750	4850
300	270	280	8250	8550	0.69	5150	5300	5450
400	300	350	9150	9750	0.73	5650	5770	5950
500	330	350	10050	10650	0.785	6100	6200	6400
600	370	390	11300	11900	0.785	6500	6650	6800
700	370	390	11300	11900	0.785	6950	7100	7300
800	370	390	11300	11900	0.785	7400	7550	7750
900	370	390	11300	11900	0.785	7850	8000	8200
1000	370	390	11300	11900	0.785	8300	8450	8650

Conditions for which Table is calculated:

No wind.

The airplane is kept in the alternate aerodrome holding area for 30 minutes before landing.



3.1.5 Calculation of Maximum Allowable Takeoff Weight, Flap Setting Angle and Decision Speed

In all expected operational conditions calculate the maximum allowable takeoff weight from the actual ambient conditions (aerodrome temperature and pressure, runway slope, wind direction and velocity, runway friction coefficient, presence of obstacles) for the field lengths available at the departure aerodrome with the runway conditions accounted for (Ref. subsection 7.3).

In preparation for flight the crew may use Tables 3.1.5.1 and 3.1.5.2.

Tables 3.1.5.1 (where a stopway, 400 m long, is available) and 3.1.5.2 (where there is no stopway) allow to determine the maximum allowable takeoff weight (MTOW), decision speed V_1 and flap setting angle for the barometric pressure and ambient temperature at the departure aerodrome, the factored takeoff distance available at a friction coefficient equal to or less than 0.5 and no precipitation layer on the runway. Before so doing, use Table 3.1.5.3 to determine the factored takeoff field length available for the wind direction and velocity.

NOTE: When using the data extracted from Tables 3.1.5.1 and 3.1.5.2 take off with flaps 28° except for the crosshatched areas corresponding to flaps 15° .

Determine the target time of acceleration up to speed V_1 since the moment of breakaway at the point of start with all the engines operating (with the actual conditions at the aerodrome accounted for) for the corrected takeoff weight and the flap setting angle following the instructions of paragraph 7.3.6.

3.1.5.1 EXAMPLE OF DETERMINATION OF MAXIMUM ALLOWABLE TAKEOFF WEIGHT

1. Conditions at aerodrome of takeoff

- Field length 2200 m (no stopway and clearway)
- Altitude 600 m
- Temperature 30°C
- Wind velocity lengthwise component -5.2 m/s (headwind)
- Friction coefficient 0.5
- Runway slope 0°

- ##### 2. Use Table 3.1.5.3 to determine the factored takeoff field length available equal to 2600 m for the wind lengthwise component direction and magnitude, as well as for the field length (with no clearway and stopway).



3. Use table 3.1.5.2 to determine for a factored takeoff field length available of 2600 m, aerodrome altitude and temperature the following data:
 - maximum allowable takeoff weight $MTOW = 98900 \text{ kg}$
 - flap setting angle equal to 28°
 - decision speed $V_1 = 242.5 \text{ km/hr}$
4. The actual takeoff weight and takeoff speeds are determined with the use of the procedure of paragraph 3.1.8.

[illegible]

[illegible]



3.2 Pre-Flight Check

banana

SECTION 4

NORMAL PROCEDURES

4.1 Taxiing

4.2 Takeoff

4.3 Climb

4.4 Enroute Flight

4.5 Descent

4.6 Landing Approach

4.7 Landing

4.8 Procedures

4.9 List of Acceptable Failures